

said ballast modules; wherein the resonance frequency is set in excess of 50 kHz.

According to another aspect of the present invention, there is provided a ballast for powering at least one ultraviolet lamp with electrical energy, said
5 at least one ultraviolet lamp being for use in a photochemical treatment of a fluid, where the ballast is to be immersed in the fluid for cooling by the fluid, the ballast comprising: a resonant circuit having a resonance frequency for generating an alternating voltage source to power said at least one ultraviolet lamp; and a driver circuit having a pulse frequency for supplying the resonant
10 circuit with pulses of electrical energy; wherein the resonance frequency is set in excess of 50 kHz.

According to another aspect of the present invention, there is provided a ballast module for use in a fluid treatment assembly having a frame to support at least one ultraviolet lamp under the control of an assembly control
15 unit, the ballast module comprising: a ballast for converting electrical energy to a form suitable to power at least one ultraviolet lamp; and a control section for interfacing with the assembly control unit and controlling said ballast under direction of the assembly control unit.

According to another aspect of the present invention, there is provided
20 a method of photochemically treating a fluid using a fluid treatment assembly, comprising immersing a plurality of ultraviolet lamps in the fluid when the assembly is in use; powering said ultraviolet lamps using a plurality of ballast modules, each of said ballast modules having a ballast electrically connected to at least one ultraviolet lamp for powering said at least one ultraviolet lamp,
25 the ballast having a resonant circuit with a resonance frequency for generating an alternating voltage source to power said at least one ultraviolet lamp and a driver circuit with a pulse frequency for supplying the resonant circuit with pulses of electrical energy; supporting said ultraviolet lamps and said ballast modules in a frame member having a portion adapted to be
30 immersed in the fluid when the assembly is in use; and receiving electrical energy, which has a voltage and a current, and providing such to said ballast modules; wherein the resonance frequency is set in excess of 50 kHz.

According to another aspect of the present invention, there is provided a method of operating a ballast for powering at least one ultraviolet lamp with electrical energy, said at least one ultraviolet lamp being for use in a photochemical treatment of a fluid, where the ballast is to be immersed in the fluid for cooling by the fluid, the method comprising: generating an alternating voltage source to power said at least one ultraviolet lamp using a resonant circuit having a resonance frequency; and supplying the resonant circuit with pulses of electrical energy using a driver circuit having a pulse frequency; wherein the resonance frequency is set in excess of 50 kHz.

According to another aspect of the present invention, there is provided a fluid treatment assembly, comprising: a ultraviolet lamp adapted to be immersed in a fluid when the assembly is in use; a ballast module for powering said ultraviolet lamp, said ballast module having a ballast electrically connected to said ultraviolet lamp for powering said ultraviolet lamp, the ballast having a resonant circuit with a resonance frequency for generating an alternating voltage source to power said ultraviolet lamp and a driver circuit with a pulse frequency for supplying the resonant circuit with pulses of electrical energy; a frame member having a portion adapted to be immersed in the fluid when the assembly is in use, the frame member supporting said ultraviolet lamp and said ballast module; and an electrical system for receiving electrical energy, which has a voltage and a current, and providing such to said ballast module; wherein the resonance frequency is set in excess of 50 kHz.

According to another aspect of the present invention, there is provided a method of photochemically treating a fluid using a fluid treatment assembly, comprising immersing an ultraviolet lamp in the fluid when the assembly is in use; powering said ultraviolet lamp using a ballast module, said ballast module having a ballast electrically connected to said ultraviolet lamp for powering said ultraviolet lamp, the ballast having a resonant circuit with a resonance frequency for generating an alternating voltage source to power said ultraviolet lamp and a driver circuit with a pulse frequency for supplying the resonant circuit with pulses of electrical energy; supporting said ultraviolet

lamp and said ballast module in a frame member having a portion adapted to be immersed in the fluid when the assembly is in use; and receiving electrical energy, which has a voltage and a current, and providing such to said ballast module; wherein the resonance frequency is set in excess of 50 kHz.

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Brief Description of the Drawings

The present invention is illustrated by the embodiments shown in the drawings, in which:

10 Figure 1 is a partial side view of a single modular UV lamp rack assembly in accordance with the invention.

Figure 2 is a cross-sectional view of a ballast module and associated connections in accordance with the invention.

Figure 3 is an end view of a ballast module used in Figure 2.

15 Figure 4 is a perspective view of a portion of a vertical conduit in a UV lamp rack assembly, useful in the present invention.

Figure 5 is a system architecture diagram of a UV water treatment site in accordance with the invention.

Figure 6 is a system architecture diagram of a ballast module in accordance with the invention.

20 Figure 7 is a schematic diagram of a ballast in accordance a preferred embodiment of the invention.

Figure 8 is a detailed schematic diagram of the best mode implementation of the preferred embodiment of Figure 7 for the resonant circuit and lamp power control of the ballast.

25 Figure 9 is a partial side view of an alternate UV lamp rack assembly in accordance with the invention.

Detailed Description of Preferred Embodiments

30 Referring to Figure 1, there is an ultraviolet lamp rack 10 which has a vertical conduit 11, a vertical support member 12 and a bar 13. Located between vertical conduit 11 and vertical member 12 are a plurality of ultraviolet lamps 14 encased in transparent sleeves 15 (partially seen in